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Some features of the Southern Hemisphere circulation in the free atmosphere affecting aircraft flights / Ivanova A.R. // Hydrometeorological research and forecasts. 2025, no. 2 (396), pp. 8-27.

A brief overview of the circulation features in the troposphere and lower stratosphere of the Southern Hemisphere is presented. Seasonal and long-term changes in the position and intensity of jet streams are considered. Features of the behavior and structure of the tropopause are described, including the polar night time. The impact of global warming and changes in stratospheric ozone on the circulation variations in the Southern Hemisphere is discussed.

Keywords: circulation indices, Southern hemisphere, tropopause, jet streams, ozone

Fig. 1. Ref. 62.

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Comparison of two subseasonal ensemble forecasting systems using the SLAV072L96 model / Kulikova I.A., Kruglova E.N., Khan V.M., Zaripov R.B., Mizyak V.G., Tolstykh M.A. // Hydrometeorological research and forecasts. 2025, no. 2 (396), pp. 28-43.

The paper presents a comparison of two ensemble forecasting systems using the SLAV072L96 model: S1 and S2, considering forecasts with a lead time up to 6 weeks. The S1 system uses an ensemble of 61 members, the breeding method is applied to generate the ensemble of initial states. The newer S2 system uses 41 members, the ensemble of initial states is prepared using data assimilation based on the local ensemble Kalman filter. It is shown that despite the smaller number of ensemble members, the S2 system is not only not inferior to the S1 system, but also has some advantages, especially at long integration intervals (up to 46 days). At the same time, both systems are characterized by insufficient ensemble spread and asymmetry in the distribution of forecast values, which requires further adjustment and improvement. It is concluded that the use and further development of the S2 system is preferable.

Keywords: forecast ensembles, breeding method, Kalman filter, verification

Tab. 1. Fig. 6. Ref. 20.

DOI: <https://doi.org/10.37162/2618-9631-2025-2-44-63>

Analysis of formation environments and prediction features of freezing rain and glaze in the Moscow region / Dmitrieva T.G., Vasil'ev E.V. // Hydrometeorological research and forecasts. 2025, no. 2 (396), pp. 44-63.

Formation environments of freezing rain and glaze, methods for their forecasting are considered. The analysis of the cases of these phenomena observed in the Moscow region in the cold seasons of 2023–2024 is performed. Approaches to operational forecasting of the events using the available modern set of information, in particular, the results of the high-resolution ICON-Ru, COSMO-Ru2.2, and COSMO-Ru6 numerical weather prediction models are analyzed. Recommendations for operational forecasters and an algorithm for forecasting freezing rain and glaze for a period up to 3 days are proposed by the example of the Moscow region.

Keywords: forecast of freezing rain and glaze, Moscow, cold season, products of high-resolution numerical weather prediction models

Tab. 2. Fig. 6. Ref. 18.

DOI: <https://doi.org/10.37162/2618-9631-2025-2-64-84>

An updated system for forecasting pollutant concentrations in the Moscow region based on the CHIMERE-2023 chemistry-transport model / Tkacheva J.V., Kuznetsova I.N. // Hydrometeorological research and forecasts. 2025, no. 2 (396), pp. 64-84.

One of the latest versions of the CHIMERE-2023 chemistry-transport model with an updated interface is actualized on the Roshydromet CRAY XC40-LC computing platform. Given that the CHIMERE-2023 model was developed and configured for use in the EU countries, the installation of the updated version for the Moscow region was accompanied by the series of numerical experiments to study the sensitivity of the model responses to changes in regional emissions and by the selection of parameters for the seasonal and daily emission distribution of the EMEP-2021 inventory used. The results of the experimental testing of the updated technology indicate generally satisfactory quality of forecasting priority pollutants, taking into account that the testing period (September 2024) was abnormal both in terms of weather conditions (the monthly mean temperature was 4 °C above normal) and in terms of air pollution with PM₁₀ particles due to the frequent influence of long-range transport, as well as due to uncharacteristic ground-level ozone, which exceeded the normal by 15–18%.

Keywords: pollutants, CHIMERE chemistry-transport model, EMEP emissions, COSMO-Ru2ETR, verification

Tab. 2. Fig. 8. Ref. 19.

DOI: <https://doi.org/10.37162/2618-9631-2025-2-85-104>

Studying the composition of the snow cover in different geomorphological zones in the Caucasus region / Agoeva E.A., Lamashvili L.S., Kumykov R.M. // Hydrometeorological research and forecasts. 2025, no. 2 (396), pp. 85-104.

The composition of the snow cover in different geomorphological zones of the Kabardino-Balkarian Republic (KBR) characterized as zones of background and impact effects is studied. The spatial distribution of component concentrations was analyzed, and the resulting data were compared with regulatory and technical documents regulating hygienic requirements. The studies showed that the snow cover in accordance with the classification of O.A. Alekin belongs to the following types: sodium bicarbonate type I, calcium bicarbonate, and ammonium bicarbonate. The total hardness characterizes the snowmelt water as soft. The agrochemical calculated parameters – the sodium adsorption coefficient (SAR) and the Stebler irrigation coefficient – characterized the samples as the ones having a low risk of soil salinization and good for irrigation applications. It was revealed that the high-altitude and mountainous territories are background ones, for which the determining factor in the formation of the snow cover composition is the long-range and regional transfer of soluble forms of components. The predominant influence on the snow cover chemistry in the background high-altitude and mountainous territories is exerted by the transboundary transport of sea salts through the Main Caucasian Ridge. The chemistry of the snow cover of the lowland zones of the KBR is associated with local pollution, mainly with poorly soluble compounds.

Keywords: Caucasus, Upper Balkar and Cherek gorges, snow cover, chemical composition, geomorphological zones

Tab. 4. Fig. 4. Ref. 32.

DOI: <https://doi.org/10.37162/2618-9631-2025-2-105-120>

Trends in annual precipitation in the Azov-Black Sea region from CMIP6 models / Polonsky A.B., Sukhonos P.A. // Hydrometeorological research and forecasts. 2025, no. 2 (396), pp. 105-120.

Using the results of numerical simulations with the CNRM-CM6-1-HR-f2, GFDL-CM4, and GISS-E2-1-G-p3 CMIP6 global climate models, projections of annual precipitation changes in the Azov-Black Sea region in the 21st century under the SSP2-4.5 climate scenario were obtained. The models were selected from the ensemble of 36 global numerical models as they adequately represent the regional precipitation regime. Trends in annual mean values of monthly total precipitation for the period of 2030–2099 and the change in the median of precipitation in the short (2030–2049), medium (2060–2079), and long term (2080–2099) with respect to the base climate period (1995–2014) were calculated. It was found that on average over the Black Sea by the end of the 21st century, a decrease in the annual values of monthly precipitation from 1,8 mm (based on the CNRM-CM6-1-HR-f2 model data) to 2,8 mm (based on the GISS-E2-1-G-p3 model data) is expected. At the same time, in certain areas of the Azov-Black Sea region (in particular, in the vicinity of the Anatolian and Caucasian coasts), a probable decrease in the annual values of monthly (annual) precipitation by the end of the 21st century will be almost 7 mm (>80 mm).

Keywords: annual precipitation, climate projections, long-term trends in precipitation, Black Sea
Fig. 4. Ref. 29.

DOI: <https://doi.org/10.37162/2618-9631-2025-2-121-140>

Activities of the World Meteorological Organization in the field of operational hydrology / Simonov Yu.A. // Hydrometeorological research and forecasts. 2025, no. 2 (396), pp. 121-140.

An overview of the activities of the World Meteorological Organization (WMO) aimed at supporting National Hydrometeorological Services (NMHSs) in the field of operational hydrology is provided: from observations, data processing, preparation and formation of information products to hydrological forecasts, calculations, as well as the assessment and management of water resources. The current WMO agenda in the field of hydrology, the goals and objectives of working groups of experts, some projects and initiatives, including the Early Warning for All Initiative, the digital transformation program for NMHSs, as well as aspects of private and public partnerships are considered. An analysis of the organizational structure of WMO in the field of hydrology is provided.

Keywords: World Meteorological Organization, operational hydrology, international cooperation
Tab. 1. Fig. 6. Ref. 23.

DOI: <https://doi.org/10.37162/2618-9631-2025-2-141-158>

A probabilistic form of streamflow forecasts / Simonov Yu.A., Khristoforov A.V. // Hydrometeorological research and forecasts, 2025, no. 2 (396), pp. 141-158.

Recommendations are proposed for issuing streamflow forecasts in a probabilistic form, which, in addition to the forecast in a deterministic form, gives an idea of the range of possible forecasted values.

It is proposed to obtain the probabilistic form of long-term and some medium-term streamflow forecasts based on the fact that forecast errors follow the normal probability distribution with constant variance. It is proposed to obtain the probabilistic form of issuing short-term and some medium-term forecasts based on the fact that the errors in the logarithms of streamflow forecasting follow the normal probability distribution with constant variance. Statistical criteria are given to test applicability of each of the methods. Examples of streamflow forecasts in the probabilistic form obtained using each of the proposed methods are given.

The proposed recommendations are intended to improve the scientific validity of the results of operational hydrological forecasting.

Keywords: streamflow, deterministic and probabilistic forecasts, verification forecasts, statistical analysis

Tab. 4. Fig. 2. Ref. 22.